भारतीय मानक

Indian Standard

IS 5115 : 2022

एलपीजी के साथ प्रयोगार्थ घरेलू भंडारण टाइप पानी के हीटर — विशिष्टि

(पहला पुनरीक्षण)

Domestic Storage Type Water Heaters For Use with LPG — Specification

(First Revision)

ICS 97.040.20

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October 2022 **Price Group 8**

Domestic and Commercial Gas Burning Appliances (Pressure Type) Sectional Committee, MED 23

FOREWORD

This Indian Standard (First revision) was adopted by the Bureau of Indian Standards on recommendation of the Domestic and Commercial Gas Burning Appliances (Pressure Type) Sectional Committee, and approved by the Mechanical Engineering Divisional Council.

This standard was first published in 1969. This standard is being revised again to keep pace with the latest technological developments and international practices. In this revision, the following major changes have been made:

a) A reference clause has been added mentioning the latest version of all the referred standards.

b) Editorial corrections have been done.

c) Clause 6 ‘Performance Requirements' has been modified.

Compliance with this standard does not in itself guarantee that satisfactory service will be attained. Conditions of use vary greatly and it is necessary to relate the standards of performance to the actual use to which the appliance will be subjected during its life.

This standard specifies the constructional and performance requirements of domestic storage type water heaters for use with liquefied petroleum gases at a working pressure of 30 gf/cm^2, designed to provide a ready supply of hot water at a maximum water temperature of 85^{o}C, having nominal capacities between 6 and 100 litres

This standard is one of a series of Indian Standards on various domestic and commercial gas burning appliances (pressure type) used with liquefied petroleum gases (LPG). General requirements of this equipment are covered in IS 5116 : 2020 Domestic and Commercial Equipment for Use with LPG — General Requirements ', which is a necessary adjunct to this standard. Should, however, any deviation exist between the requirements given in IS 5116 and those given in this standard, provisions of the latter shall apply. Other standards published so far in the series are IS 4246 : 2002 'Domestic gas stoves for use with liquefied petroleum gases — Specification (fifth revision)', IS 15558 : 2005 ‘Mini domestic water heater for use with LPG — Specification’, IS 4473 : 2002 'Domestic gas ovens for use with liquefied petroleum gases (first revision)' and IS 11480 : 1998 'Domestic grillers for use with liquefied petroleum gases — Specification (first revision)'. Specification for bulk water heater for use with liquefied petroleum gases (LPG) covered in IS 5776 : 1988 'Bulk water heaters for use with LPG (first revision)'.

The composition of the Committee responsible for the formulation of this standard is given in Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

Indian Standard

DOMESTIC STORAGE TYPE WATER HEATERS FOR USE WITH LPG — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard specifies the constructional and performance requirements of domestic storage type water heaters for use with liquefied petroleum gases at a working pressure of 30 gf/cm^2, designed to provide a ready supply of hot water at a maximum water temperature of 85 ^oC, having nominal capacities between 6 and 100 litres.

2 REFERENCES

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. In case the standards are to be referred in this clause they are to be listed as follows:

IS No		*Title*
404 (Part 1) : 1993	:	Lead pipes — Specification : Part 1 for other than chemical purposes (*third revision*)
554 : 1999	:	Pipe threads where pressure-tight joints are made on the threads — Dimensions, tolerances and designation (*fourth revision*)
1239 (Part 2) : 2011	:	Steel tubes, tubulars and other steel fittings — Specification : Part 2 steel pipe fittings *(fifth revision)*
5116 2020	:	Domestic and commercial equipment for use with LPG — General requirements (*fourth revision*)
6480 1988	:	Glossary of terms relating to domestic and commercial gas burning appliances *(first revision)*

3 TERMINOLOGY

3.1 For the purpose of this standard the following definitions, in addition to the definitions given in **2** of IS 6480 shall apply.

3.2 Storage Type Water Heater — A self-contained appliance in which a volume of water is heated under thermostatic control and stored for use when required.

4 MATERIALS

In addition to the relevant material requirements specified in **5** of IS 5116, the requirements given in **4.1** to **4.4** shall apply.

4.1 Apparatus plates and all bosses for screwed connection shall be made of gunmetal or brass of brazing quality. All pipes for water and gas shall be of copper, brass or other suitable material not inferior to copper or brass in resistance to corrosion under normal working conditions.

4.2 Outer casing of the water heater shall be constructed from corrosion resisting

material or shall be adequately protected from corrosion on all surfaces.

4.3 The material used for lagging the water heater shall be such that it does not corrode the container or other parts in contact with it and does not crumble, sag, or deteriorate in use to such an extent that its efficiency is impaired. It shall be immune to attack by vermin and moisture.

4.4 The gas cocks and taps shall be made of a material prescribed in **5.6** of IS 5116.

5 CONSTRUCTION

In addition to the relevant constructional requirements specified in Section 1 of IS 5116, the requirements given in **5.1** to **5.17** shall apply.

5.1 The material used for the container shall be of adequate thickness to provide sufficient mechanical rigidity and adequate strength to withstand the pressure test as given in Annex A.

5.2 All seams, joints, bosses for screwed connections and flanges of permanent nature shall be secured by welding or brazing or soldering. If soft solder (tin-lead alloy) is used for jointing, the solder shall not be depended upon for mechanical strength and this shall be assured by spot welding, dovetailing, riveting or other similar methods.

5.3 The lagging material if provided shall be packed and supported in a manner that precludes the possibility of large air pockets developing within it.

5.4 Fixing

There shall be adequate provision for fixing and supporting the water heaters so that no stress is transmitted to water pipes or gas pipes.

5.4.1 Water heaters may be arranged for floor or wall mounting.

5.5 Facility of Maintenance

Similar parts of water heaters of the same make, model and size shall be readily interchangeable. The parts which may require maintenance or replacement shall, as far as practicable, be so located as to assure easy access and replacement.

5.5.1 Each gas jet or burner complete with jet shall be readily accessible for replacement and shall hear a characteristic jet or burner identification mark.

5.5.2 It shall be possible to remove the burner without breaking the inlet and outlet water connections or the flue gas connection of the appliance or draining the tank.

5.5.3 To remove the water and gas sections the use of screwdrivers and adjustable spanners only shall be required.

5.5.4 The component parts and particularly heat exchanger shall be easily-accessible and easy to clean. (Vessels whose interiors are inaccessible shall be accepted if fitted with a suitable drain plug easily recognizable and accessible).

5.6 Gas inlet connections shall conform to the requirements given in **5.6.1** below and **18** of IS 5116.

5.6.1 The gas inlet connections for different appliance ratings shall be as follows :

Sl No.	**Maximum rating of appliance**	**Minimum bore mm**
(1)	(2)	(3)
i)	Up to and including 10 080 kcal/h	6
ii)	Over 10 080 kcal/h and including 25 200 kcal/h	9
iii)	Over 25 200 kcal/h	13

5.7 Water Connections

Whenever the water connections to the water haters including valves, taps, pipes and pipe fittings are threaded, the threads shall comply with IS 554. The diameter of water connections for inlet and outlet used on water heaters shall be as follows [*see* also IS 404 (Part 1) and IS 1239 (Part 2)].

Sl No.	*Capacity*	*Minimum Size*
	l	*mm*
i)	6	15
	15	
	25	
	35	
	50	
ii)	70	20
	100	

5.7.1 It shall be possible to descale all waterways susceptible to the formation of scale.

5.8 Gas and Water Taps

The water heaters shall be provided with such gas and water taps as are essential for the normal operation of the appliance by the user. This requirement does not include water taps for control at outlets remote from the appliance. If taper-plug type water taps are used as a part of the water heater, they should comply with the requirements of taper plug gas cocks.

5.8.1 *Gas Taps*

These shall conform to **8.1 to 8.12** of IS 5116. These taps shall be accessible to the user, to enable the gas supply to the pilot and main burner to be turned on and off. On heaters with an input exceeding 10 080 kcal/h either a pilot gas tap that interlocks with the main gas tap or a 2 stage gas tap with a ‘pilot’ position, should be provided.

5.9 Gas Rate Adjusters

Where provided, gas rate adjusters shall be set and sealed by the manufacturer and shall not be liable to accidental alteration.

5.10 Primary Air Regulator

Any aeration adjuster shall not be capable of closing the air inlet completely and shall not the liable to accidental alteration.

5.11 Jet Fixing

It shall not be possible to loosen completely burner jets or injector jets without the use of tools.

5.12 Pilot Burner

A lighting pilot shall be provided if the heat input exceeds 1 500 kcal/h.

5.12.1 Pilots shall conform to the requirements given in **13** of IS 5116.

5.12.2 Pilot burners must be so fitted that they can be easily removed.

5.13 Flame Failure Device

Every appliance shall be incorporated with, a flame failure device and shall satisfy the requirements specified in **14** of IS 5116.

5.14 Flue Outlet

The appliance shall have provision for connection to a flue outlet unless the heat input does not exceed 1 500 kcal/h or the storage capacity does not exceed 25 litres.

5.14.1 All appliances of capacity over 14 litres of water or gas consumption of over 250 g/h, shall be fitted with a connection to a vent pipe for the combustion gases.

5.14.2 *Draught Diverter*

Every water heater requiring connection to a flue shall incorporate a draught diverter.

5.15 Gas Pressure Tapping

A gas pressure tapping shall be fitted after the automatic gas valve. The pressure required at the point shall be durably marked in gf/cm^2 near the tapping.

5.16 Filter

A suitable filter shall be provided in the gas way before the thermostatic valve and the pilot gas tapping.

5.17 Water Regulator

Appliances with water surfaces open to the atmosphere must be provided with a device intended for regulating the rate of flow of the water.

6 PERFORMANCE REQUIREMENTS

In addition to the relevant requirements specified in Section 2 of IS 5116**,** the requirements given in **6.1** to **6.16** shall apply.

6.1 General Conditions of Test

The requirements as given in **19** of IS 5116 shall apply.

6.1.1 *General Test Condition*

6.1.1.1 *Test room*

The appliance shall be installed in a well-ventilated, draught-free room that has an ambient temperature of 20 to 30 °C.

Test room conditions shall apply for thermal efficiency, combustion, gas consumption and resistance to draught. All other performance requirements may be tested at actual room conditions.

6.1.1.2 *Accuracy of measurements*

Except where otherwise specified, the instruments used shall permit measurements to be made with the following accuracy :

Sl No.	Parameters	Accuracy Required
(1)	(2)	(3)
i)	Water temperature, °C	± 0.5
ii)	Surface temperature, °C	± 2
iii)	Gas temperature, °C	± 0.5
iv)	Gas volume, percent	± 0.5
v)	Time, s	± 0.5
vi)	Weight, percent	± 0.1
vii)	Gas pressure, gf/cm^2	± 0.3
viii)	Water pressure, percent	± 2
ix)	Test air pressure, percent	± 2
x)	Atmospheric pressure, gf/cm^2	± 1

6.2 Draw-off Water Temperature

When tested according to method given in Annex B, draw-off water temperature shall be according to the requirements given in **6.2.1** and **6.2.2**.

6.2.1 The maximum water temperature obtainable at the highest thermostat setting shall be as follows :

a) It should not exceed 70 °C under equilibrium conditions and unless the water is required for special purposes; and

b) It shall not exceed 90 °C, if successive small quantities are drawn at frequent intervals.

6.2.2 The outlet water temperature obtained after drawing-off quantity of water equal to half the total capacity of the water heater shall be within 8 °C of the highest temperature, obtained.

6.3 Anti-drip Device

The storage water heaters with open delivery shall be provided with an anti-drip device. The quantity of water required to cause water to flow through the outlet shall be between 2.5 and 4 percent inclusive of water capacity of the container when tested in accordance with the method described in Annex C. The device shall be so designed that a continuous flow from the outlet of the heater is obtained with not more than 50 percent of the manufacturer's normal flow rating, and that the flow of water is interrupted cleanly.

6.4 Loss by Evaporation

The evaporation loss from an appliance with inlet water control shall not exceed 5 percent of the total contents, when operated for 12 hours at maintenance gas rate.

6.5 Water Temperature in Feed Cisterns

The temperature rise of the water is an integral ball-valve-feed cistern after heating the appliance up when cold and operating it at maintenance gas rate for 4 hours shall not exceed 15 °C at an initial water temperature and ambient air temperature of 27 ± 2 °C.

6.6 Thermal Efficiency

The thermal efficiency, when tested as described in Annex D, shall be not less than 70 percent.

6.7 Combustion

When sampled as detailed in **6.7.1**, the carbon monoxide/ carbon dioxide ratio of the products of combustion shall not exceed 0.02 at any rate between the minimum operational rate and an overload rate of 12.5 percent above the manufacturer's normal rate. The test shall be made at a sufficient number of heat input rates to determine the combustion performance over the whole of the prescribed range.

6.7.1 All appliances shall be fed with cold water so as to maintain a temperature rise of 16 ± 5 °C at normal heat input, and sampling shall be carried out when thermal equilibrium has been established. Wherever practicable a sampling hood shall be used having the following characteristics:

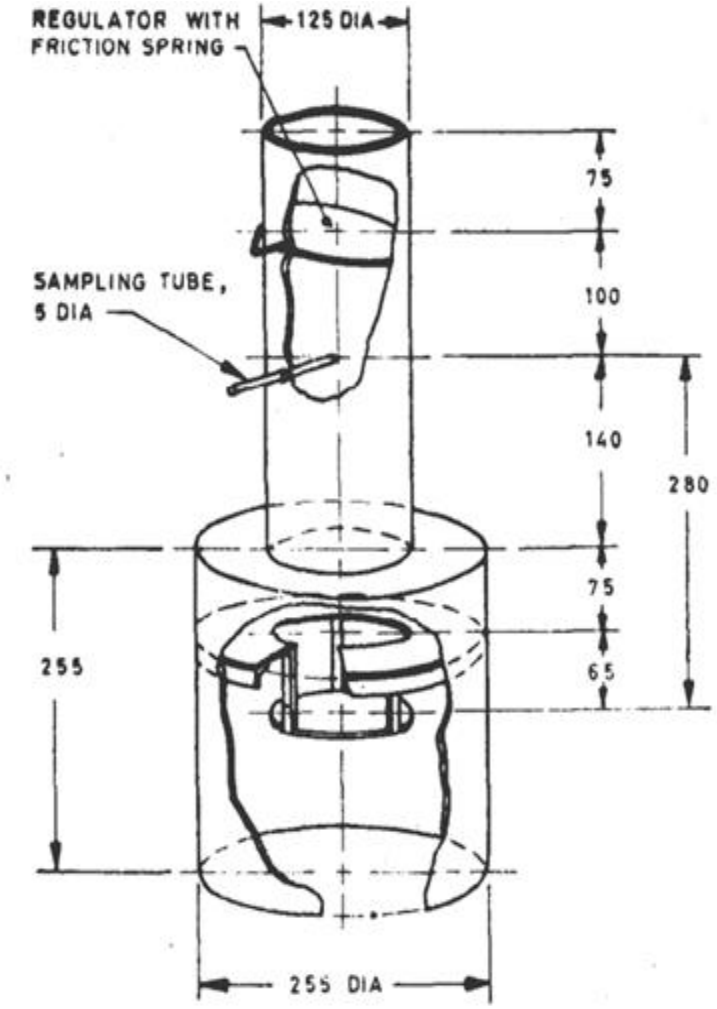
a) It shall collect all the products from the appliance,

b) Products shall not spill from the periphery of the hood,

c) There shall not be undue dilution of products with excess air, and

d) The hood shall not interfere with the combustion of gas in the water heater.

A hood suitable for most purposes is shown in Fig. 1, where the hood would interfere with test conditions, the products of combustion shall be collected from a convenient part of the flue duct. This may be done by means of L shaped probe inserted into the duct and arranged so that the open end can scan the duct cross-section while sample is withdrawn. When the infra-red gas analyzer is used, complete mixing may be ensured by passing the sample to a 1-litre flask; alternatively, the products may be drawn from the probe into an aspirator.



All dimensions in millimeters

FIG 1. HOOD FOR WATER HEATER

6.8 Gas Soundness

The relevant requirement given in 16 of IS 5116 shall apply.

6.9 Water Soundness

All water carrying parts of the appliance individually and when assembled to form the water circuit of the appliance shall not leak or show any permanent distortion during or after the test when tested at a hydrostatic pressure 4 kgf/cm^2. The water circuit shall be kept under pressure for a minimum 5 min.

6.10 Gas Consumption

With the taps fully opened and with the burners operating at the maximum consumption, the appliance shall give within ±8 percent of the manufacturer's recommended gas consumption in g/h or heat input in kcal/h at 2.942 kN/m^2 (30 gf/cm^2) gas inlet pressure, when tested as per **20.4** of IS 5116 at STP (by using air and then converting to LPG).

6.11 Ignition and Flame Travel

6.11.1 There shall be easy and safe access for lighting the pilot burner by a

matchstick and it shall be easy to see that the burner or burners are lighted from the pilot. Where the burner or burners are lighted by automatic ignition, it shall not be possible for gas to be admitted to the main burner without igniters being on.

6.11.2 If the flame is applied to any one burner port, when the gas is flowing, flame travel shall be complete. This applies for all pressures from 25 gf/cm^2 to 35 gf/cm^2 taps being fully open.

6.11.3 If the burner is ignited from a pilot flame, ignition shall be smooth at pressures from 25 gf/cm^2 to 35 gf/cm^2 with the tap turned full on and ignition shall be affected without delay after turning on the taps.

6.12 Flame Stability

It shall be possible to operate the appliance with tap fully open at gas inlet pressure from 2.452 kN/m^2 to 3.432 kN/m^2 (25 gf/cm^2 to 35 gf/cm^2) without the flame either extinguishing, blowing off or striking back and without the formation of soot. The pilot flame shall be stable, without lifting or soot deposition, at this gas inlet pressure.

6.13 Noise Control

The ignition of the burner flame, their operation and turning off shall not give rise to undue or excessive noise during all the operation tests.

6.14 Flash-Back

While the appliance is in operation at full gas consumption, the flame shall be immediately reduced to the minimum possible and then brought back to full size. The operation shall be repeated five times. No flash-back shall occur during the test. This applies to all pressures from 25 gf/cm^2 to 35 gf/cm^2.

6.15 Resistance to Draught

There shall be no extinction of the flame on any of the burners operating at maximum consumption when the appliance is placed in a normal (not localized) current of air with a velocity of 2 m/s, as measured with a rotating vane anemometer. The location of the appliance relative to adjacent walls and the direction of the draught shall be varied to correspond to likely conditions of appliance installation. This applies for all pressure from 2.452 kN/m^2 to 3.432 kN/m^2 (25 gf/cm^2 to 35 gf/cm^2).

6.16 Fire Hazard and Limiting Temperature

The relevant requirements given in **23** of IS 5116 shall apply.

7 INSTRUCTIONS

In addition to the requirements specified in **24** of IS 5116, the requirements specified in **7.1** to **7.4** below shall apply.

7.1 Water heater shall be supplied with clear instructions supplemented, if necessary, with diagrams or illustrations indicating the method of installation and connection and precautions necessary to provide for the expansion of water during heating and relief of partial vacuum, if likely to occur. Attention may also be drawn to the requirements of statutory authorities,

Attention should be drawn to the need for periodical descaling of the inner container of the water heater depending upon the hardness of the water being used.

7.2 Instructions sheet shall contain the warning against installing appliances in confined space, for example shower cubicles.

7.3 Total weight of appliance when full and warning against mounting on walls or floors of insufficient strength.

7.4 Warning against connecting the appliance directly to the mains if it is not designed to withstand an inlet water test pressure of 15 kgf/cm^2.

8 MARKING

8.1 Each water heater shall be legibly and indelibly marked with the following :

a) Permissible maximum working head of water (for controlled outlet water heaters);

b) Water capacity in litres;

c) Total heat input in kcal/h with commercial butane;

d) Recovery time for water to reach 65 °C (average) from 15 °C with an ambient temperature of 15 °C; and

e) Hot and cold-water connections shall he clearly and permanently identified;

f) Manufacturer's name, initials or registered trade-mark;

g) Serial number;

h) The words for use with liquefied petroleum gas (LPG) at 2.942 kN/m^2 (30 gf/cm^2);

j) The total gas consumption at 30 gf/cm^2;

k) Warning — 'For use in well ventilated areas only' — To be written on the front of the body of the appliance in Red Colour as well as prominently on the outer package;

m) Any special instructions for safe operation;

n) Country of origin;

p) Temperature chart corresponding to the thermostat setting, if the adjustable thermostat is provided.

8.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

9 PACKING

9.1 The requirements given in **25** of IS 5116 shall apply.

ANNEX A

(*Clause* 5.1)

PRESSURE TEST FOR WATER HEATER CONTAINERS

A-1 The container of every water heater shall be subjected for a period of 5 minutes to a hydraulic or pneumatic test pressure as follows, and shall not show any leakage or appreciable permanent distortion.

a) Heaters intended to withstand only the head of water they contain (for example, those with a broken feed) shall be sound when completely filled with water at maximum water temperature.

b) Other heaters intended for connection to a cistern supply shall not leak or show any sign of distortion at a water pressure 50 percent greater than the recommended maximum head.

c) Other heaters with inlet water controls shall not leak or show any sign of distortion at a pressure to be agreed to between the manufacturer and the testing authority.

d) Heaters intended to withstand mains water pressure shall not leak or show any sign of damage or distortion at a static water pressure of 20 kgf/cm^2.

NOTE — Heaters designed to expose the water surface open to the atmosphere are exempted from the above test.

ANNEX B

(*Clause* 6.2)

METHOD FOR DETERMINATION OF DRAW — OFF TEMPERATURE

B-l PROCEDURE

B-l.1 Light the gas and continue heating until three consecutive readings of the gas rate indicate that a minimum has been reached in the case of a gradual acting thermostat, or that the main gas supply has been closed in the case of a snap-acting thermostat. Turn out the gas, admit cold water at the manufacturer's rated flow, and plot a curve of outlet water temperature against the volume of water delivered, taking temperature readings every few seconds.

ANNEX C

(*Clause* 6.3)

METHOD OF TEST FOR ANTIDRIP DEVICE

C-l PROCEDURE

C-l.1 Fit a suitable water flow meter in the inlet water supply and note the minimum inlet water flow rate required to give a continuous delivery whilst the device is operating. Turn off the water control tap, and when flow through the outlet has ceased add water (for example, via funnel connected to a 2-way cock in the inlet supply) until water flows from the outlet. Determine the minimum quantity required to cause water to flow.

ANNEX D

(*Clause* 6.6)

METHOD FOR DETERMINATION OF THERMAL EFFICIENCY

The gas is taken in a small bottle weighing 1 kg or 2 kg. The bottle is fitted with an 'ON/OFF' valve and is connected to a regulator which, in turn, is connected to a pressure gauge and to the appliance. A second 'ON/OFF' gas valve shall be inserted in the gas way up stream of the regulator as near the possible to the gas bottle.

D-1 PROCEDURE

D-1.1 The appliance shall be filled with cold water at 20 ± 5 °C to its normal capacity of less than 1 litre for each 20 litres and fraction thereof. Weight of the water shall be noted. The lid of the appliance shall be fitted with an aluminium stirrer and a mercury-in-glass thermometer calibrated to 0.5 ^{o}C least count.

D-1.2 To commence the test, initial temperature of water shall be recorded and the burner lighted; simultaneously the stopwatch shall be started and meter reading noted. The thermometer shall be observed periodically and stirring commenced when the temperature reaches 80 °C. When the temperature reaches 85 ^{o}C, the gas shall be turned off and the watch stopped. Stirring is continued until the maximum temperature is reached on the thermometer.

D-1.3 Cold water at a measured temperature and at a steady flow shall be admitted at the top. The displaced water shall be drawn off through the shortest possible length of pipe at the bottom into weighed- bin (or sequence of bins), the temperature is measured at the point of draw-off every few seconds and observations shall be continued until the temperature of the water being drawn off is within 1 °C of the inlet water temperature. A smooth curve of temperature against time shall be plotted; the area A below the curve shall be computed, and from this area and the rate of flow of water, the total heat content of water shall be calculated.

D-2 CALCULATIONS

D-2.1 The thermal efficiency of the appliance shall be calculated as follows :

$$\text{Thermal efficiency, percent} = \frac{R\,A\,100}{W\,Q}$$

where

R = Rate of flow of water in kg/min,

A = Area under time-temperature curve in min ^{o}C,

W = Weight of the gas in g, and

Q = Net calorific value of the gas used in kcal/g.

NOTE —

1) In the above calculations, the water equivalent of the appliance is not taken into account.

2) The net calorific value of gas is used. If this is not determined experimentally, the value may be taken as 10.9 kcal/g for calculation.

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Domestic and Commercial Gas Burning Appliances Sectional Committee, MED 23

Organization	*Representative(s)*
L.P.G. Equipment Research Centre, Bengaluru	SHRI ASHISH BERA (***Chairman***)
Agnisumukh, Bengaluru	SHRI HARI RAO
BSH Household Appliances Manufacturing Private Limited, Chennai	SHRI VIJAY KUMAR LOGANATHAN
Bharat Petroleum Corporation Limited, Mumbai	SHRI SUDIPTA SARKAR SHRI MOHIT RANE (*Alternate*)
Bureau of Energy Efficiency, New Delhi	MS PRAVATANALINI SAMAL SHRI KAMRAN SHAIKH (*Alternate*)
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Goyal Engineers Private Limited, New Delhi	SHRI AJAY GOYAL SHRI NEERAJ GOYAL (*Alternate*)
Hindustan Petroleum Corporation Limited, Mumbai	SHRI DILIP KUMAR RAY SHRI SIVA SHANKAR (*Alternate*)
Kabsons Gas Equipment Pvt. Ltd., Hyderabad	SHRI SATISH KABRA SHRI KUNAL KABRA (*Alternate*)
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Indian Institute of Technology Guwahati, Guwahati	SHRI MUTHU KUMAR
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Organization	*Representative(s)*
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L.P.G. Equipment Research Centre, Bengaluru	SHRI P. R. DEODHAR SHRI RAHUL SHARMA (*Alternate*)
Petroleum Conservation Research Association, New Delhi	SHRI SURENDRA PRATAP
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Vanaz Engineers Limited, Pune	SHRI A. A. TAMBOLI SHRI V. N. PUJARI (*Alternate*)
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Member Secretary

SHRI SANDEEP KESHAV

Scientist 'C' (MED), BIS

Bureau of Indian Standards

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Review of Indian Standards

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This Indian Standard has been developed from Doc No.: MED 23 (18752).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi